LASER NEUTRALIZATION OF UXO

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Category: Render Safe/Neutralization

In 1998, the use of lasers to neutralize unexploded ordnance (UXO) in the field moved out of the laboratory and into the operational environment. The Nellis EOD team has employed a 2KW YAG laser for the past year during clearance operations on cluster bomb (CBU) test and training ranges with a high degree of success. The benefits of this application were immediately apparent when you consider the mission requirement for the Nellis EOD team.

The cluster bomb targets at the Nellis Air Force Base Bombing and Gunnery Range see the highest concentration of air-delivered, improved conventional munitions (ICMs) of all the test and training ranges in the DoD. Literally hundreds of "cans" of CBU are dropped on the three certified targets between EOD clearance operations. All factors considered, the UXO count ranges from a few hundred to thousands of ICMs. When a target reaches its "can" limit, EOD teams go in a performed demolition operations to clear the UXO. This required EOD troops wearing heavy body armor and carry 30 pounds of demolition explosives to walk carefully through the UXO contaminated areas, destroying each UXO individually. Sort of an EOD man's Easter egg hunt. The advent of a tactical laser for UXO clearance changed the way the mission is done.

The laser mounted on an armored platform provides a standoff attack means to destroy the ICMs while minimizing the EOD team's exposure to the UXO. With training and practice, a four man EOD team operating two lasers can destroy several hundred UXO items in the same period a twelve-man team employing traditional demolition techniques can. The difference being, the laser teams will not expend explosives and will operate in a much safer environment. Although the preferred reaction in a range clearance mission is UXO detonation, The laser teams also learned techniques to achieve different results.

UXO could be brought to detonation or deflagration temperatures depending on angle off attack, standoff distances beam quality, and spot placement on the UXO. For example, heating the case near the front edge of the shaped charge cone can deflagrate shaped charge munitions. The case would burn through, the explosive ignited, and the UXO simply burns out. However, heat the same munition near its thickest point and it would quickly (4-10 seconds) come to high order detonation.

Laser technology is changing the way Nellis EOD does CBU/ICM range clearance. As clean-up of all DoD test and training ranges become a reality, the enhancements offered lasers over other methods mean the jobs can be performed safely and efficiently. The laser will never replace the trained, experienced EOD technician, but it will give him a tool capable of addressing the threat of modern ICMs and other "smart" weapons without exposing the technician to the lethal effects of the UXO. As laser technology matures and combines with emerging technologies such as robotics, as well as traditional UXO clearance methods, we will have the tools needed for the future.

Explosive Ordnance Disposal (EOD) And Laser Neutralization

- History of UXO Clean-up
- Our Problem
- The Nellis Initiative
- The Future In Laser Technology
- Why It Will Work

Nutshell History
UXO Clean-up Problem

- **UXO neutralization technology hasn't kept up with the work load**
  - ***Manpower/resource intensive & extremely dangerous work***
- **Clean-up not viewed as part of the mission**

Typical BLU-97 field - Nellis AFB R-63

Nellis EOD Team "Geared Up" for a demolition run through the CBU grid

UXO Clean-up History

EOD techs placing demo charges next to CBU

- **EOD/UXO neutralization technology and methods hasn't advanced with the threat - Doing 90s UXO w/1945 tools and methods**
  - ***Heavily dependent on the EOD tech armed with C-4 and a dearmer - Or less!***
- **Safety is a matter of training, concentration, and a degree of luck!**

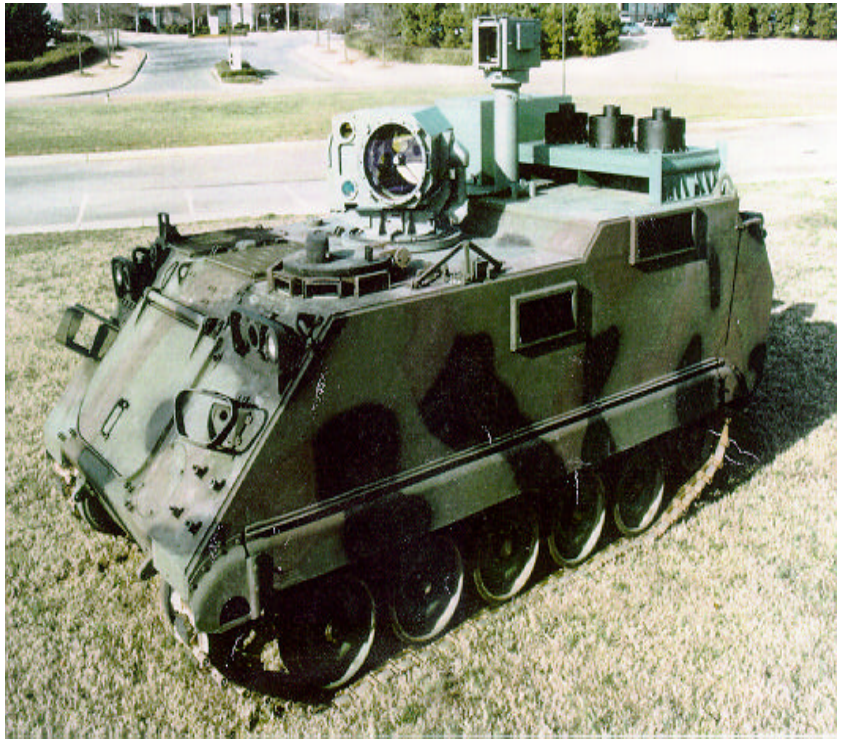
Our Problem:
UXO Neutralization Mired in 1945 Technology & Methodology

- **Huge advances in detection, location, and identification of UXO**
- **Introduction of robotics systems enhanced clearance methods and scrap collection**
- **No significant, affordable neutralization system is available**
- ***Is There?***

The All-Purpose Remote Transport System (ARTS) configured for CBU "windrow" operations

THE NELLIS INITIATIVE

Lead EOD Into the Next Century By Finding and Fielding New Technologies to Neutralize UXO



1st generation Laser Neutralization System

- **'96/97- Located the MODS prototype- Brought it to Nellis - killed UXO**
  - ***Successfully <u>detonated</u> hundreds of unexploded CBU delivered munitions from 35 - 100 meters***
  - ***Learned techniques to vary the result***
  - ***developed CONOPS for concurrent range clean-up functions and equipment***
  - ***Identified equipment shortfalls for the next generation laser neutralization system***

UXO NEUTRALIZATION
THE FUTURE IN LASER TECHNOLOGY

- **Laser technology Works!**
  - ***MODS was outdated technology when we got it - it proved the concept and kept interest alive***
- **Nellis EOD taking delivery of 2nd generation LNS "ZEUS" in Jun 99 for OT&E**
  - ***Demonstrate and test improvements in system efficiency reliability***
  - ***Measure LNS as a environmentally better tool than current methods***
  - ***Measure reduction in consumable supplies (demo)***
  - ***Kill Bombs!***

ZEUS - 2nd generation LNS for UXO neutralization

UXO NEUTRALIZATION
THE FUTURE IN LASER TECHNOLOGY

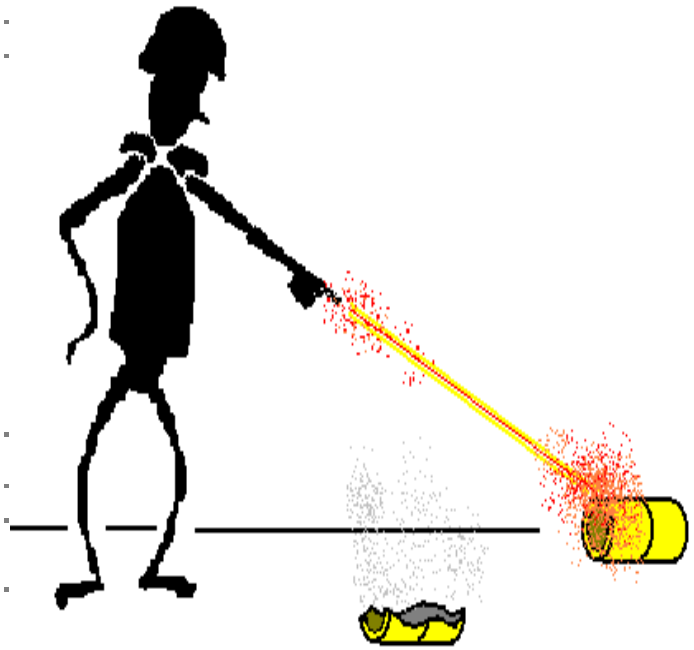
Artist concept of the ARTS LNS

- Parallel effort at Air Force Research Laboratory (AFRL) to develop a laser attachment for the ARTS
- Static fire at Kirtland AFB Jul 99 - Initial field demo at Nellis AFB Dec 99 (tentative)
- Will provide a totally remote system
- The Nellis View: There's a role for both systems

LASER NEUTRALIZATION

Why It Will Work For Us

- **Constant, renewable source of energy for UXO neutralization**
- **Potential for reduced impact on limited EOD manpower and resources - Free up people for other missions/roles**
- **Provide a capability to do effective and safe clean-up of high UXO threat areas**
- **Potential environmental enhancements to UXO neutralization**
- **#1 Reason for us, the field techs: *Dramatic safety enhancements in ICM/CBU/Mine neutralization***



QUESTIONS?